ORIGINAL ARTICLE

Knowledge and Attitudes toward Human Papillomavirus and Human Papillomavirus-Vaccine Acceptance among Females in Saudi Arabia

Mohammed Zaid Aljulifi[1], Fatimah Saleh Alzeadi[2], Yazin Nabeel Alharbi[3], Sirin Mohammed Aljaghthami[4], Lujain Adel A. Daghriri[5], Amin Talat Qusti[6], Noor Mohammed Al-faraj[4], Rahaf Awad Al-thaqfan[7], Renad Jamal Assas[8], Ruya Adel Abdullah[9], Bakr Abdulmohsen Abu Alola[10], Khames T. Alzahrani[11]

[1]Department of Family and Community Medicine, College of Medicine, Majmaah University, Majmaah, Saudi Arabia, [2]Department of Family and Community Medicine, Qassim University, Buraydah, Saudi Arabia, [3]Department of Family and Community Medicine, College of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia, [4]Department of Family and Community Medicine, King Abdulaziz University, Rabigh, Saudi Arabia, [5]Department of Family and Community Medicine, College of Medicine, King Khalid University, Abha, Saudi Arabia, [6]Department of Family and Community Medicine, Umm Al Qura University, Makkah, Saudi Arabia, [7]Department of Family and Community Medicine, King Khalid University, Abha, Saudi Arabia, [8]Department of Family and Community Medicine, Heraa General Hospital, Makkah, Saudi Arabia, [9]Department of Family Medicine, Security Forces Hospital Program, Makkah, Saudi Arabia, [10]Department of Family and Community Medicine, Al-Noor Hospital, Makkah, Saudi Arabia, [11]PGD Endo from Stanford University, Saudi Board of Endodontic SR, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia

Abstract

Background: Human papillomavirus (HPV) poses significant health risks globally, being a primary cause of cervical cancer (CC) and other malignancies. CC remains a leading cause of morbidity and mortality among women in Saudi Arabia, with an incidence rate of 1.9/100,000 women. Previous studies have indicated a general lack of awareness surrounding HPV and its vaccine among the Saudi population. **Objective:** This study aimed to assess knowledge, awareness, and HPV vaccine acceptance among females in Saudi Arabia. **Methods:** A cross-sectional study was conducted from July 2024 to March 2025, enrolling Saudi females aged 12 years and older through questionnaires. A total of 798 participants were included, comprising both medical professionals and the general public. Variables of interest included demographic information, knowledge levels regarding HPV, and attitudes toward HPV vaccination. **Results:** Among participants, 74.7% reported awareness of HPV, with the internet being the most referenced information source (37.1%). However, significant gaps were identified: 50.6% were unaware that HPV can be asymptomatic, and 60.2% lacked knowledge regarding its association with various cancers. Only 3.3% had undergone HPV testing, while 48% recognized the vaccine's potential to prevent CC and genital warts. Notably, 69.2% expressed willingness to receive the vaccine if offered for free, and 83.7% supported educational interventions to enhance awareness. Knowledge levels correlated significantly with age, education, and income, with 37.8% demonstrating low knowledge levels and only 34.1% showing high knowledge regarding HPV. **Conclusion:** The study reveals a mixed understanding of HPV and its vaccine among Saudi women, highlighting significant gaps in knowledge despite a generally positive attitude toward vaccination. Enhanced educational outreach and targeted interventions are crucial to improve awareness and acceptance of the HPV vaccine, thereby supporting public health initiatives aimed at reducing HPV-related disease incidence.

Key words: HPV infection, HPV vaccines, human papillomavirus, infection, vaccine

Address for correspondence:
Rahaf Awad Al-thaqfan,
King Khalid University, Abha, Saudi Arabia.
E-mail: rhoff1290@gmail.com

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INTRODUCTION

Human papillomavirus (HPV) is a group of small, double-stranded DNA viruses with more than 200 different types.[1] HPV is a significant worldwide health concern since it is the most prevalent sexually transmitted infection that can cause a range of medical illnesses, including benign warts and malignant tumors such as cervical, anal, and oropharyngeal cancers.[2] Cervical cancer (CC) constitutes one of the most significant contributors to gynecological cancer-associated morbidity and mortality.[3] Due to CC high morbidity and mortality rates and its global prevalence, it has a significant effect on public health.[4] The first HPV vaccine was approved by the FDA in 2006 as a primary prevention of CC.[5] The incidence rate of CC in Saudi Arabia is 1.9/100,000 women, as demonstrated by the Ministry of Health.[3] Based on the HPV Information Center report, CC is the 2nd cause of cancer among women and cancer-related deaths.[6] 2019 marked the completion of a study on Saudi Arabia. The findings indicate that the general public is misinformed about CC, Pap screens, HPV, and the relationship between HPV and CC.[7] Whereas another research conducted in the same year revealed, an improved attitude about HPV among medical students is correlated with increased awareness of the disease and its risks.[8]

The purpose of the study is to assess the knowledge and attitudes toward the HPV and to find out the acceptance of the Human Papilloma Vaccine among females in Saudi Arabia. This study was conducted due to the limited representation of the general female population in existing research on knowledge and awareness of HPV infection and acceptance of the HPV vaccine in Saudi Arabia. Most previous studies have relied on small sample sizes, often limited to specific subgroups such as parents or medical students. As a result, their findings may not accurately reflect the broader attitudes and knowledge of the female population in Saudi Arabia. Consequently, the findings derived from such studies do not accurately reflect the female population in Saudi Arabia.

Objective

The aim of this study was to assess the knowledge and awareness level of HPV infection and acceptance of its vaccine among Saudi Arabia's females.

METHODOLOGY

Study design

This cross-sectional study was conducted between July 2024 and March 2025 in Saudi Arabia.

Study setting

This was participants, recruitment, and sampling procedure:

The study's population consisted of Saudi females aged 12 years old or above with all educational levels; participants were recruited in July 2024 from people who received the questionnaire.

Sample size

The sample size was estimated using the Raosoft online sample size calculator (http://www.raosoft.com/samplesize.html). This study's minimal target sample size was 384, with an established margin of error of 5% and a confidence interval of 95%.

Inclusion and exclusion criteria

The inclusion criteria for this study were as follows: Saudi females (12 years old or above) with all educational levels, medical field workers or students, and non-medical field workers or students were included. Non-Saudi citizens, the pediatric population (younger than 12 years old), and the male Gender were excluded from the study.

Method for data collection and instrument (Data collection technique and tools)

Data were collected using a Google Form that was semi-structured and verified. The questionnaire involved closed-ended questions to evaluate population demographics, vaccination, attitudes, knowledge, and acceptance regarding HPV. Demographic data included gender, age, educational degree, social status, and occupation. Knowledge regarding HPV includes vaccination, symptoms, and transmission. Items connected regarding HPV vaccination concerns.[9]

Scoring system

The awareness level was assessed using 25 items, with a "0" value for incorrect answers and a "1" value for correct answers. The total awareness score was assessed using Bloom's cutoff. Based on this cutoff point, a score between 80% and 100% (20–25) was good awareness, 60–79% moderate knowledge (19–15), and <60% (14 or less) was scored as poor awareness.

The study used a questionnaire to assess the knowledge and awareness level of HPV infection and acceptance of its vaccine among Saudi Arabian females. The questionnaire was in Arabic to ensure that it was available to the participants. Ten individuals from the study community were tested to ensure the suitability of the questionnaire for the study's subject.

Pilot test

The questionnaire was distributed to 20 individuals and asked to fill it. This was done to test the simplicity of the questionnaire and the feasibility of the study. Data from the pilot study were excluded from the final data of the study.

Analysis and entry method

The data analysis was conducted using SPSS version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to provide a summary of the sociodemographic characteristics and the responses to the knowledge and attitude items. Inferential statistics, including Chi-square tests, were utilized to analyze the associations between sociodemographic variables such as age, gender, education level, and knowledge regarding HPV vaccination. The threshold for statistical significance was established at $P < 0.05$.

RESULTS

Table 1 displays various demographic parameters of the participants with a total number of (798). With a mean age of 30.3 years and a standard deviation of 11.0, the distribution of participants spans a wide age range. Notably, nearly 54.9% of participants are single, emphasizing the youthful demographic, as a significant proportion, approximately 19.0% are aged 21 years or younger. The overwhelming majority of the respondents, at 97%, identify as Saudi nationals, suggesting a homogenous cultural context. Geographically, the Western region encompasses the largest share at 47.1%, which may reflect urbanization patterns or regional economic dynamics. Educational attainment is notably high, with 69.2% holding a bachelor's degree or higher, aligning with trends in workforce development and suggesting a well-educated populace. In addition, income data indicate that over half of the participants earn 3000 or less monthly, highlighting potential economic challenges faced by many individuals.

As shown in Figure 1, the data presented from a total sample size of 798 respondents reveals insightful trends in the sources from which individuals derive their information about the HPV. A significant majority, constituting 37.1% of the respondents, identify the internet and social media as their primary source, with 296 individuals reporting this avenue. In contrast, information sourced from workplace interactions accounts for 24.6%, as indicated by 196 respondents. Family and friends contribute to 5.5% of the responses, amounting to 44 individuals, while healthcare providers are cited by a modest 6.8% (54 respondents). Notably, print and electronic media are hardly leveraged, with only 1.8% (14 respondents) recognizing them as sources. In addition, 18.5% of participants (148 individuals) reported having no information about HPV, highlighting a significant gap in awareness.

Table 1: Socio-demographic characteristics of participants (*n*=798)

Parameter	No.	Percent
Age (Mean: 30.3, STD: 11.0)		
21 years or less	152	19.0
22–23	130	16.3
24–25	112	14.0
26–30	124	15.5
31–44	154	19.3
45 years or more	126	15.8
Nationality		
Saudi	774	97.0
Non-Saudi	24	3.0
Region of residence		
Northern region	28	3.5
Southern region	196	24.6
Central region	150	18.8
Eastern region	48	6.0
Western region	376	47.1
Educational level		
Middle school	14	1.8
High school	106	13.3
Diploma	72	9.0
Bachelor's degree	552	69.2
Postgraduate degree	52	6.5
Uneducated	2	0.3
Marital status		
Single	438	54.9
Married	328	41.1
Divorced	24	3.0
Widowed	8	1.0
Number of children (Mean: 1.1, STD: 1.8)		
0	514	64.4
1–3	174	21.8
4–5	86	10.8
More than 5	24	3.0
Occupational status		
Student	298	37.3
Employee	270	33.8
Freelancer	12	1.5
Unemployed	184	23.1
Retired	34	4.3
Monthly income		
3000 or less	414	51.9
4,000–10,000	206	25.8
11,000–15,000	105	13.2
More than 15,000	73	9.1

Table 2: Parameters related to knowledge toward human papillomavirus (HPV) and HPV-vaccine acceptance (*n*=798)

Parameter	No.	Percent
Have you previously heard about HPV?		
No	146	18.3
Yes	596	74.7
I don't know	56	7.0
What is your source of information about HPV?		
Family/friends	44	5.5
Workplace	196	24.6
Internet/social media	296	37.1
Healthcare providers	54	6.8
Print/electronic media	14	1.8
Others	46	5.8
None	148	18.5
Is it possible that a person with an HPV infection does not show any visible symptoms?		
No	68	8.5
Yes	326	40.9
I don't know	404	50.6
HPV infections are not associated with		
Lung cancer	206	25.8
Skin cancer	40	5.0
Cervical cancer	52	6.5
Ovarian cancer	8	1.0
Genital warts	12	1.5
I am not sure	480	60.2
HPV infections can be sexually transmitted?		
True	360	45.1
False	92	11.5
I am not sure	346	43.4
Have you ever been tested/ screened for HPV?		
Yes	26	3.3
No	708	88.7
I am not sure	64	8.0
Do you think you are at risk of HPV infection?		
Yes	82	10.3
No	322	40.4
I am not sure	394	49.4
Have you previously heard about the HPV vaccine?		
Yes	498	62.4
No	146	18.3
I am not sure	154	19.3
What is your source of information about the HPV vaccine?		
Family/friends	38	4.8
Workplace	164	20.6
Internet/social media	244	30.6
Healthcare providers	72	9.0
Print/electronic media	16	2.0
Others	74	9.3
None	190	23.8
Do you think the HPV vaccine can help to prevent genital warts?		
Yes	396	49.6
No	26	3.3
I am not sure	376	47.1
Do you think the HPV vaccine can help to prevent cervical cancer?		
Yes	416	52.1
No	22	2.8
I am not sure	360	45.1
Which age group is recommended to receive the HPV vaccine?		
From birth to 9 years	34	4.3
9–26 years	308	38.6
26 years or more	118	14.8
Any age	116	14.5
I am not sure	222	27.8
Are you aware of the availability of the HPV vaccine in Saudi Arabia?		
Yes	482	60.4
No	80	10.0
I am not sure	236	29.6

As illustrated in Table 2, the data provide revelations regarding public knowledge of HPV and HPV vaccine acceptance among a cohort of 798 individuals. Notably, a significant majority, 74.7%, have previously heard of HPV, with the internet and social media being the predominant sources of information for 37.1% of respondents. This highlights the crucial role of digital platforms in disseminating health-related information. However, a concerning 50.6% are unaware that HPV can be asymptomatic, indicating a gap in understanding that could hinder effective prevention strategies. Furthermore, the high

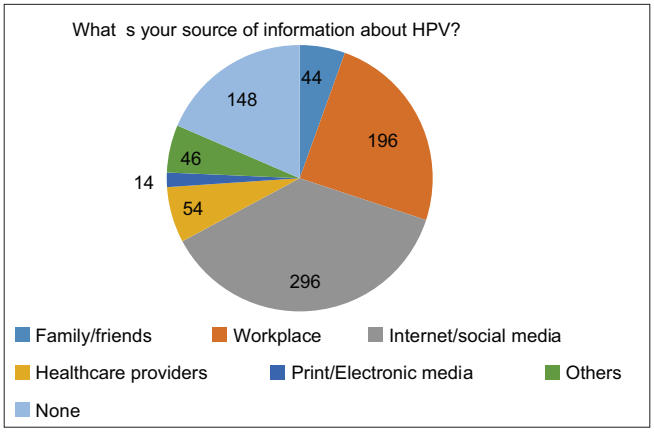

Figure 1: Illustrates source of information about human papillomavirus among participants

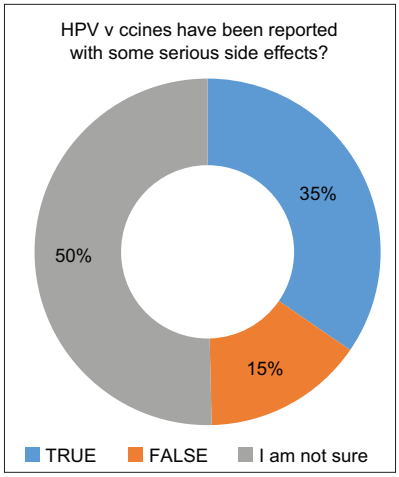

Figure 2: Illustrates if side effects are reported regarding human papillomavirus vaccine among participants

percentage of respondents (60.2%) who are uncertain about HPV's association with various cancers emphasizes the need for improved educational outreach. Only 3.3% reported having been tested for HPV, reflecting low screening rates, while nearly half believe that vaccination can aid in preventing genital warts and CC.

As shown in Figure 2, in examining the data concerning public perceptions of HPV vaccines and their associated side effects, the total sample size is 798 respondents. Notably, 276 individuals, representing approximately 34.6% of the sample, acknowledged having encountered reports of serious side effects related to HPV vaccination, indicating a significant level of concern among this population segment. In contrast, a smaller contingent, totaling 120 respondents, or about 15.0%, firmly denied the existence of such reports; this reveals a minority that may possess a more positive perception of vaccine safety. The largest group, comprising 402 respondents and accounting for 50.4%, expressed uncertainty regarding the potential side effects.

Table 3 reveals a comprehensive overview of participants' attitudes regarding the HPV and their acceptance of the HPV vaccine, which is crucial for public health initiatives. Notably, a significant portion of respondents (38.6%) correctly identified the recommended age group for vaccination, yet a substantial 27.8% expressed uncertainty, indicating a notable gap in awareness that could impede vaccination efforts. The data reveal a positive inclination toward vaccination, with 69.2% willing to accept the vaccine if offered at no cost, suggesting that financial barriers may play a role in vaccine uptake. Interestingly, a majority (83.7%) advocated for educational interventions to enhance awareness, underscoring a collective recognition of the need for improved information dissemination. Furthermore, the high percentage (86.0%) of participants who believe increased knowledge would bolster vaccine acceptance highlights the critical link between education and health behavior.

The data presented in Table 4 reveal critical insights into the knowledge levels regarding HPV and the acceptance of the HPV vaccine among the surveyed population. Notably, a significant portion of respondents, constituting 37.8%, demonstrated low knowledge levels, which raises concerns about the effectiveness of current educational initiatives. In contrast, those identified as highly knowledgeable represent 34.1%, while the moderate knowledge group accounts for 28.1%.

The data presented in Table 5 elucidate the attitudes toward HPV and the acceptance of the HPV vaccine within a diverse population sample. Notably, a significant majority of respondents, constituting 70.2%, exhibit a positive attitude toward HPV and its associated vaccination, underscoring a general willingness to engage in preventive healthcare measures. In contrast, a moderate attitude is reflected by 19.5% of the respondents, indicating a potential area for further education and outreach. Meanwhile, the 10.3% of individuals displaying a negative attitude highlight the challenges that remain in public health messaging and vaccination acceptance.

Table 6 shows that knowledge level about HPV and HPV vaccine has a statistically significant relation to age ($P = 0.0001$), nationality ($P = 0.003$), education level ($P = 0.050$), number of children ($P = 0.031$), occupational status ($P = 0.020$), monthly income ($P = 0.0001$). It also shows a statistically insignificant relation to region of residence and marital status.

Table 7 shows that attitude level about HPV and HPV vaccine has a statistically significant relation to age ($P = 0.002$), region of residence ($P = 0.0001$), education level ($P = 0.003$), and marital status ($P = 0.008$). It also shows a statistically insignificant relation to nationality, occupational status, monthly income, and number of children.

DISCUSSION

HPV is a sexually transmitted, non-enveloped, and double-stranded DNA virus recognized as the primary cause of

Table 3: Participants' attitudes toward human papillomavirus (HPV) and HPV-vaccine acceptance (*n*=798)

Parameter	No.	Percent
Will you receive the HPV vaccine if offered by the healthcare sector without any cost?		
Yes	552	69.2
No	84	10.5
I am not sure	162	20.3
Will you receive the HPV vaccine if offered by the healthcare sector with some cost?		
Yes	432	54.1
No	144	18.0
I am not sure	222	27.8
Would you get your daughters vaccinated with the HPV vaccine if offered by the healthcare sector without any cost?		
Yes	550	68.9
No	74	9.3
I am not sure	174	21.8
Will you get your daughters vaccinated with the HPV vaccine if offered by the healthcare sector with some cost?		
Yes	480	60.2
No	118	14.8
I am not sure	200	25.1
HPV vaccines have been reported to have some serious side effects.		
True	276	34.6
False	120	15.0
I am not sure	402	50.4
Would you hesitate to get the HPV vaccine due to fear of needle/injection?		
Agree	250	31.3
Disagree	436	54.6
I am not sure	112	14.0
Would you hesitate to get the HPV vaccine due to cost?		
Agree	130	16.3
Disagree	542	67.9
I am not sure	126	15.8
Would you hesitate to get the HPV vaccine due to refusal from family/friends/community?		
Agree	126	15.8
Disagree	558	69.9
I am not sure	114	14.3
Would you recommend others to get vaccinated with the HPV vaccine?		
Agree	470	58.9
Disagree	74	9.3
I am not sure	254	31.8
Do you have any questions related to the HPV vaccines (availability, safety, efficiency) in your mind?		
Yes	370	46.4
No	332	41.6
I am not sure	96	12.0
Do you think there is a need to carry out educational sessions to increase knowledge and awareness about the HPV vaccine in your community?		
Yes	668	83.7
No	34	4.3
I am not sure	96	12.0
Do you think there will be more acceptability towards the HPV vaccine if people get to know more about HPV vaccines?		
Yes	686	86.0
No	36	4.5
I am not sure	76	9.5

Table 4: Knowledge toward human papillomavirus (HPV) and HPV-vaccine acceptance score results

Knowledge level	Frequency	Percent
Highly knowledgeable	272	34.1
Moderate knowledge	224	28.1
Low knowledge level	302	37.8
Total	798	100.0

Table 5: Attitude toward human papillomavirus (HPV) and HPV-vaccine acceptance score results.

Attitude level	Frequency	Percent
Positive attitude	560	70.2
Moderate attitude	156	19.5
Negative attitude	82	10.3
Total	798	100.0

various cancers, including oral, oropharyngeal, vulvar, vaginal, and CCs, as well as genital warts. The most commonly detected serotypes associated with CC are HPV serotypes 16, 18, and 31. Infection with these oncogenic serotypes can lead to precancerous cervical lesions, which may progress

Table 6: Relation between knowledge level about human papillomavirus and socio-demographic characteristics

Parameters	Knowledge level		Total (*n*=798)	*P*-value*
	High or moderate knowledge	Low knowledge level		
Age				
21 years or less	72	80	152	0.0001
	14.5%	26.5%	19.0%	
22–23	100	30	130	
	20.2%	9.9%	16.3%	
24–25	78	34	112	
	15.7%	11.3%	14.0%	
26–30	88	36	124	
	17.7%	11.9%	15.5%	
31–44	94	60	154	
	19.0%	19.9%	19.3%	
45 years or more	64	62	126	
	12.9%	20.5%	15.8%	
Nationality				
Saudi	488	286	774	0.003
	98.4%	94.7%	97.0%	
Non-Saudi	8	16	24	
	1.6%	5.3%	3.0%	
Region of residence				
Northern region	18	10	28	0.060
	3.6%	3.3%	3.5%	
Southern region	114	82	196	
	23.0%	27.2%	24.6%	
Central region	108	42	150	
	21.8%	13.9%	18.8%	
Eastern region	32	16	48	
	6.5%	5.3%	6.0%	
Western region	224	152	376	
	45.2%	50.3%	47.1%	
Educational level				
Middle school	10	4	14	0.050
	2.0%	1.3%	1.8%	
High school	66	40	106	
	13.3%	13.2%	13.3%	
Diploma	36	36	72	
	7.3%	11.9%	9.0%	
Bachelor's degree	342	210	552	
	69.0%	69.5%	69.2%	
Postgraduate degree	40	12	52	
	8.1%	4.0%	6.5%	
Uneducated	2	0	2	
	0.4%	0.0%	0.3%	

(Contd...)

Table 6: (*Continued*)

Parameters	Knowledge level		Total (*n*=798)	*P*-value*
	High or moderate knowledge	Low knowledge level		
Marital status				
Single	278	160	438	0.761
	56.0%	53.0%	54.9%	
Married	200	128	328	
	40.3%	42.4%	41.1%	
Divorced	14	10	24	
	2.8%	3.3%	3.0%	
Widowed	4	4	8	
	0.8%	1.3%	1.0%	
Number of children				
0	334	180	514	0.031
	67.3%	59.6%	64.4%	
1–3	106	68	174	
	21.4%	22.5%	21.8%	
4–5	46	40	86	
	9.3%	13.2%	10.8%	
More than 5	10	14	24	
	2.0%	4.6%	3.0%	
Occupational status				
Student	186	112	298	0.020
	37.5%	37.1%	37.3%	
Employee	182	88	270	
	36.7%	29.1%	33.8%	
Unemployed	108	76	184	
	21.8%	25.2%	23.1%	
Freelancer	4	8	12	
	0.8%	2.6%	1.5%	
Retired	16	18	34	
	3.2%	6.0%	4.3%	
Monthly income				
3000 or less	236	178	414	0.0001
	47.6%	58.9%	51.9%	
4000–10,000	130	76	206	
	26.2%	25.2%	25.8%	
11,000–15,000	67	38	105	
	13.5%	12.6%	13.2%	
More than 15,000	63	10	73	
	12.7%	3.3%	9.1%	

**P*-value was considered significant if ≤0.05

to more advanced stages of cancer, while other serotypes are typically cleared by the immune system of the host.[10] Approximately 80% of sexually active women are at risk of contracting HPV.[11] HPV infections are usually transient and often resolved during early life; however, if they persist, they can result in various benign lesions and malignancies affecting the ano-genital region and oropharyngeal tract in both genders.[12] Notably, epidemiological data revealed that in 2018, there were 570,000 new cases and 311,000 deaths attributed to CC worldwide, making it the fourth most

Table 7: Attitude level toward human papillomavirus in association with socio-demographic characteristics

Parameters	Attitude level		Total (*n*=798)	*P*-value*
	Moderate or negative attitude	Positive attitude		
Age				
21 years or less	52	100	152	0.002
	21.8%	17.9%	19.0%	
22–23	26	104	130	
	10.9%	18.6%	16.3%	
24–25	30	82	112	
	12.6%	14.6%	14.0%	
26–30	28	96	124	
	11.8%	17.1%	15.5%	
31–44	50	104	154	
	21.0%	18.6%	19.3%	
45 years or more	52	74	126	
	21.8%	13.2%	15.8%	
Nationality				
Saudi	234	540	774	0.153
	98.3%	96.4%	97.0%	
Non-Saudi	4	20	24	
	1.7%	3.6%	3.0%	
Region of residence				
Northern region	4	24	28	0.0001
	1.7%	4.3%	3.5%	
Southern region	46	150	196	
	19.3%	26.8%	24.6%	
Central region	54	96	150	
	22.7%	17.1%	18.8%	
Eastern region	32	16	48	
	13.4%	2.9%	6.0%	
Western region	102	274	376	
	42.9%	48.9%	47.1%	
Educational level				
Middle school	6	8	14	0.003
	2.5%	1.4%	1.8%	
High school	30	76	106	
	12.6%	13.6%	13.3%	
Diploma	28	44	72	
	11.8%	7.9%	9.0%	
Bachelor's degree	148	404	552	
	62.2%	72.1%	69.2%	
Postgraduate degree	24	28	52	
	10.1%	5.0%	6.5%	
Uneducated	2	0	2	
	0.8%	0.0%	0.3%	

(Contd...)

Table 7: (*Continued*)

Parameters	Attitude level		Total (*n*=798)	*P*-value*
	Moderate or negative attitude	Positive attitude		
Marital status				
Single	118	320	438	0.008
	49.6%	57.1%	54.9%	
Married	104	224	328	
	43.7%	40.0%	41.1%	
Divorced	10	14	24	
	4.2%	2.5%	3.0%	
Widowed	6	2	8	
	2.5%	0.4%	1.0%	
Number of children				
0	138	376	514	0.104
	58.0%	67.1%	64.4%	
1–3	62	112	174	
	26.1%	20.0%	21.8%	
4–5	30	56	86	
	12.6%	10.0%	10.8%	
More than 5	8	16	24	
	3.4%	2.9%	3.0%	
Occupational status				
Student	82	216	298	0.404
	34.5%	38.6%	37.3%	
Employee	92	178	270	
	38.7%	31.8%	33.8%	
Unemployed	52	132	184	
	21.8%	23.6%	23.1%	
Freelancer	4	8	12	
	1.7%	1.4%	1.5%	
Retired	8	26	34	
	3.4%	4.6%	4.3%	
Monthly income				
3000 or less	132	282	414	0.613
	55.5%	50.4%	51.9%	
4,000–10,000	56	150	206	
	23.5%	26.8%	25.8%	
11,000–15,000	30	75	105	
	12.6%	13.4%	13.2%	
More than 15,000	20	53	73	
	8.4%	9.5%	9.1%	

*P-value was considered significant if ≤ 0.05

commonly diagnosed cancer and the fourth leading cause of cancer-related mortality among women.[13] Several risk factors contribute to the progression of HPV-related diseases, including the host's immune response efficacy and specific characteristics of the virus, such as its genotype, the presence of co-infections with multiple HPV strains, viral load, and its integration into the host genome. In addition, co-factors such as alcohol consumption, smoking, and co-infections with

other pathogens are associated with the development of ano-genital cancers. Preventive measures for CC primarily focus on reducing HPV transmission, with vaccination being one effective method. Nevertheless, in many regions, awareness and acceptance of HPV vaccination remain insufficient.[14] Thus, we aimed in this study to assess the knowledge and awareness level of HPV infection and acceptance of its vaccine among Saudi Arabia's females.

Regarding the knowledge and attitudes toward HPV and HPV-vaccine acceptance among females, our study findings revealed a mix of awareness and significant knowledge gaps that are echoed in the literature. While our study found that 74.7% of respondents had heard of HPV, this awareness is relatively lower compared to a study conducted in India, which reported that over 80% of participants were aware of the availability of an HPV vaccine.[15] In our research, we identified critical gaps in understanding HPV, highlighting that half of the respondents were unaware of its asymptomatic nature, and 60.2% lacked knowledge about its cancer associations, underscoring a strong need for enhanced educational outreach. This concern is supported by findings from Btoush *et al*.,[16] which indicated low overall knowledge regarding HPV infection and its vaccine among Latina mothers, aligning with prior studies indicating similar patterns among Latino parents.[17,18] In addition, a qualitative study demonstrated various misconceptions about HPV transmission, pointing to a broader issue of misinformation that can undermine public health efforts.[19,20] In our study, we noted that 69.2% of respondents expressed willingness to accept the HPV vaccine if it were free, akin to the findings of Wang *et al*., where an overwhelming 95.8% of unvaccinated female adults showed a willingness to be vaccinated despite high unvaccinated rates.[21] Furthermore, our data revealed that while 38.6% of participants accurately identified the recommended vaccination age, 27.8% remained uncertain, which aligns with findings from Biyazin *et al*., where only 70.2% of female students expressed awareness about HPV vaccination.[22] Both our study and the global context indicate significant gaps that could impede vaccination efforts and overall public health. Moreover, our findings showed that 37.8% of participants demonstrated low knowledge levels, contrasting with a moderate knowledge level reported by Villanueva *et al*. (54.34 ± 0.9%).[23] Despite this, our respondents exhibited a generally positive attitude toward vaccination, as seen in our report of a 70.2% positive attitude, which, although encouraging, reflects a critical need for targeted educational interventions that can improve knowledge scores similar to what Trucchi *et al*. observed, where more than 93% recognized HPV's association with serious diseases despite lower risk perception statistics.[24] Interestingly, societal and cultural factors play a substantial role in attitudes toward vaccination, an assertion supported by findings highlighting that social barriers inhibit the administration of the vaccine due to concerns regarding discussions about sexuality among various community members.[25] Finally, the effectiveness of targeted educational interventions, such as those facilitated through social media platforms like Facebook, was confirmed in a study in Taiwan, emphasizing the importance of innovative approaches in improving knowledge and attitudes toward HPV vaccination.[26]

CONCLUSION

Our study reveals significant gaps in knowledge and attitudes regarding the HPV and its vaccination among females in Saudi Arabia. Although a majority of participants (74.7%) were aware of HPV, over half lacked a critical understanding of its asymptomatic nature and its association with cancer. Despite these knowledge deficits, there is a notable willingness to accept the HPV vaccine, particularly if provided at no cost, with 69.2% indicating interest. The strong correlation between educational background and knowledge suggests that targeted educational interventions are essential. Furthermore, the identification of a considerable portion of respondents (37.8%) with low knowledge emphasizes the urgent need for public health initiatives aimed at increasing awareness. Our findings underline the importance of innovative and culturally sensitive educational strategies, particularly through digital platforms, to enhance understanding and ultimately improve HPV vaccination acceptance and CC prevention in this population.

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ETHICAL APPROVAL

Informed consent was obtained from each participant after explaining the study in full and clarifying that participation was voluntary. Data collected were securely saved and used for research purposes only.

INFORMED CONSENT

Written informed consent was obtained from all individual participants included in the study.

DATA AND MATERIALS AVAILABILITY

All data associated with this study are presented in the paper.

REFERENCES

1. Radevska AM, Brava E, Skeparovska K, Gacova I, Micevska A, Rangelova VR, *et al*. Knowledge, attitudes and practices towards HPV infections, complications of HPV infections and the HPV vaccine among students of Medical Science in North Macedonia. Acad J Health Sci 2024;39:45-52.
2. Algaadi SA, Aldhafiri HJ, Alsubhi RS, Almakrami M, Aljamaan NH, Almulhim YA. The Saudi population's knowledge and attitude towards human papillomavirus (HPV) infection and its vaccination. Cureus 2024;16:e58427.
3. Honnavar P, Mansoor E, Tulloch C, Udayan U, Cosmello I, Patel P, *et al*. Cervical cancer and human papillomavirus awareness among women in Antigua and Barbuda. Medicina (Kaunas) 2023;59:1230.
4. Turki YM, Alqurashi J. Knowledge, attitudes, and perceptions towards Human Papillomavirus (HPV) Vaccination among adult women in primary health care centers in Makkah, Saudi Arabia. Cureus 2023;15:e44157.
5. Alsous MM, Ali AA, Al-Azzam SI, Abdel Jalil MH, Al-Obaidi HJ, Al-Abbadi EI, *et al*. Knowledge and awareness about human papillomavirus infection and its vaccination among women in Arab communities. Sci Rep 2021;11:786.
6. Issa T, Babi A, Issanov A, Akilzhanova A, Nurgaliyeva K, Abugalieva Z, *et al*. Knowledge and awareness of human papillomavirus infection and human papillomavirus vaccine among Kazakhstani women attending gynecological clinics. PLoS One 2021;16:e0261203.
7. Almehmadi MM, Salih MM, Al-Hazmi AS. Awareness of human papillomavirus infection complications, cervical cancer, and vaccine among the Saudi population. A cross-sectional survey. Saudi Med J 2019;40: 555-9.
8. Almutairi SN, Aljalfan AA, Alqahtani ZA, Shadid AM, Khan SU. Knowledge of human papillomavirus, risk of anogenital cancers, and benefits of vaccination: A medical student survey in Saudi Arabia. Cureus 2019;11:e5051.
9. Darraj AI, Arishy AM, Alshamakhi AH, Osaysi NA, Jaafari SM, Sumayli SA, *et al*. Human papillomavirus knowledge and vaccine acceptability in Jazan Province, Saudi Arabia. Vaccines (Basel) 2022;10:1337.
10. Scott M, Nakagawa M, Moscicki AB. Cell-mediated immune response to human papillomavirus infection. Clin Diagn Lab Immunol 2001;8:209-20.
11. Fernandes JV, Fernandes T, de Araújo JM. Human papillomavirus infection in adolescents. In: Smith HB, editor. Handbook on Human Papillomavirus: Prevalence, Detection and Management. United States: Nova Science Publishers; 2013. p. 181-212.
12. Serrano B, Brotons M, Bosch FX, Bruni L. Epidemiology and burden of HPV-related disease. Best Pract Res Clin Obstet Gynaecol 2018;47:14-26.
13. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2018;68:394-424.
14. Schiffman M, Kjaer SK. Chapter 2: Natural history of anogenital human papillomavirus infection and neoplasia. J Natl Cancer Inst Monogr 2003;31:14-9.
15. Ganju SA, Gautam N, Barwal V, Walia S, Ganju S. Assessment of knowledge and attitude of medical and nursing students towards screening for cervical carcinoma and HPV vaccination in a tertiary care teaching hospital. Int J Community Med Public Health 2017;4:4186-93.
16. Btoush R, Brown DR, Tsui J, Toler L, Bucalo J. Knowledge and attitudes toward human papillomavirus vaccination among Latina mothers of South American and Caribbean Descent in the Eastern US. Health Equity 2019;3:219-30.
17. Reiter PL, Gupta K, Brewer NT, Gilkey MB, Katz ML, Paskett ED, *et al*. Provider-verified HPV vaccine coverage among a national sample of Hispanic adolescent females. Cancer Epidemiol Biomarkers Prev 2014;23:742-54.
18. Chau J, Kibria F, Landi M, Reilly M, Medeiros T, Johnson H, *et al*. HPV knowledge and vaccine acceptance in an uninsured Hispanic population in Providence, RI. R I Med J 2014;97:35-9.
19. Morales-Campos DY, Markham CM, Peskin MF, Fernandez ME. Hispanic mothers' and high school girls' perceptions of cervical cancer, human papilloma virus, and the human papilloma virus vaccine. J Adolesc Health 2013;52(5 Suppl):S69-75.
20. Aragones A, Genoff M, Gonzalez C, Shuk E, Gany F. HPV vaccine and Latino immigrant parents: If they offer it, we will get it. J Immigr Minor Health 2016;18: 1060-5.
21. Wang S, Ren W, Zhang B, Chen M, Liu S, Zhu Y, *et al*. Knowledge, attitude, and uptake of Human Papillomavirus (HPV) Vaccination among Chinese female adults: A national cross-sectional web-based survey based on a large e-commerce platform. Matern Child Health J 2024;28:746-57.
22. Biyazin T, Yilma A, Yetwale A, Fenta B, Dagnaw Y. Knowledge and attitude about human papillomavirus vaccine among female high school students at Jimma town, Ethiopia. Hum VaccinImmunother 2022;18:2036522.
23. Villanueva S, Mosteiro-Miguéns DG, Domínguez-Martís EM, López-Ares D, Novío S. Knowledge, attitudes, and intentions towards human papillomavirus vaccination among nursing students in Spain. Int J Environ Res Public Health 2019;16:4507.
24. Trucchi C, Amicizia D, Tafuri S, Sticchi L, Durando P,

Costantino C, *et al*. Assessment of knowledge, attitudes, and propensity towards HPV vaccine of young adult students in italy. Vaccines (Basel) 2020;8:74.
25. Oliveira FB, Gelatti LC. Adolescents' adherence to HPV vaccination in the municipality of Uruaçu, Goiás. FASEM Ciênc. 2014;6:1-8.
26. Lai CY, Wu WW, Tsai SY, Cheng SF, Lin KC, Liang SY. The effectiveness of a Facebook-assisted teaching method on knowledge and attitudes about cervical cancer prevention and HPV vaccination intention among female adolescent students in Taiwan. Health Educ Behav 2015;42:352-60.

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